

Safer Gastrectomy

100 Consecutive Cases Without Mortality

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SUMMARY

Duodenal stump disruption accompanied by fatal peritonitis is the complication most to be feared following gastrectomy and anastomosis by any one of the Billroth II modifications.

While many explanations of this complication have been presented and many means devised to prevent it, by far the most frequent cause is distention of the proximal duodenum because of obstruction at the stoma due to kinks, angulations or post-operative edema.

A supplemental report is made on a disintegrating T-tube designed to facilitate gastroenteric anastomosis, insure patency of the stoma and make impossible obstruction of the proximal loop.

This report covers 100 consecutive instances in which the disintegrating tube was used and emphasizes the favorable postoperative course usually experienced by the patients.

WHENEVER and wherever gastrectomy and anastomosis by any one of the Billroth II modifications is discussed there is always a note of warning about the danger of disruption of the duodenal stump as the complication most to be feared because it is the complication most likely to cause death. Much has been written both in explanation of this complication and as to means to prevent it. Attention has been directed to faulty suture technique as one of the causes of stump disruption. The use of too many layers has been blamed for failure to heal on the basis of interference with circulation. Cauterization of the stump has similarly been considered by some to be responsible. Then, too, the general condition of the patient, with particular reference to fluid and the electrolyte balance, serum proteins and vitamin status, has been weighed in connection with faulty healing.

The most common cause of stump disruption is a mechanical one and consists of increased intraluminal pressure consequent upon kinks, angulations or edema at the stoma, following which there is no satisfactory egress for the daily 1,500 cc. or more of bile, pancreatic and duodenal secretions, with resultant undue pressure upon the duodenal stump, which, however well it may have been sutured, ultimately gives way. McNealy³ lays spe-

cial stress upon the danger of this complication and presents his method for preventing pressure upon the stump by an infolding tamponade.

In 1945 one of the authors,¹ working with Mr. Grover C. Miller, chemist of the Seal-Ins Laboratories,* Los Angeles, designed a disintegrating tube to be placed in the gastroenteric stoma at the time of resection.

This tube is a further development of the principle used in the timed enteric coating for tablets and capsules developed by Mr. Miller several years ago. Its dependability has been proved by many investigators, including its use in intestinal anastomotic rings as reported by Richards and Thomas.⁴ The material used in making these tubes varies somewhat from the enteric coating, but the principle is the same. Percentages are changed to meet timing requirements. These tubes are composed of the following: stearic acid, U.S.P., carnauba wax No. 1, white purified beeswax, petroleum jelly, powdered elm bark, and an antiseptic, merthiolate 1 to 7,000. Also, barium sulfate is combined in the mixture to cast a shadow in case it should be desired to take a roentgenograph at any time during the period of the tube's disintegration within the patient. This material has a melting point of approximately 85° C. The purpose of the powdered elm bark is to absorb water and expand; the expanding gradually splits away the waxes and permits a further penetration of the moisture into the wall. The timing is controlled by the percentage of elm bark used. There is a small thin reinforcement strand of silk imbedded in the walls of the tube which materially strengthens it, and not only reduces the danger of breaking at the time of operation but makes it impossible for any part of the tube to separate from the stem before disintegration takes place. The tube may be sterilized by placing it in a zephiran chloride solution, 1 to 1,000, for 15 minutes at room temperature.

This disintegrating tube is easily understood by reference to the accompanying illustrations. It is inserted into the anastomosis when all but the anterior suturing is completed. It lies loosely in the stoma without anchoring, but is held in that position by its configuration. Its multiple fenestrations encourage free flow of duodenal and gastric contents into the distal jejunum and make it impossible for blocking to occur. Its presence at the time of the anastomosis acts as an excellent guide for suturing and prevents the formation of kinks and angulations. With this framework, it is almost impossible to

*The authors have no financial interest in any product of the Seal-Ins Laboratories.

make a faulty anastomosis. It does not in any manner cause pressure upon the suture line or adjoining tissue. It disintegrates in approximately 96 hours, thus affording patency to the stoma during the most critical postoperative period, and removing itself automatically when that function is no longer required. No complication or untoward circumstance has arisen attributable to the use of the tube.

Sufficient experience with this device has now accumulated over the past three and a half years to justify a further report. This experience lends itself well to summary in the following tables:

Number of cases in which Alesen tube was used:

100 cases.

Average diet:

Liquid diet second day.

Soft diet third to fourth day.

Average temperature postoperatively:

100° to 101° F. first day.

Less than 100° F. by third day.

Type of operation:

1. Anterior Polya	58
2. Hofmeister Polya, anterior.....	32
3. Posterior Polya	4
4. Balfour Hofmeister, anterior.....	3
5. Posterior gastroenterostomy	2
6. Vagotomy and posterior gastroenterostomy.....	1

Indications for operation:

Intractability	43
Obstruction	23
Hemorrhage	25
Carcinoma	5
Leiomyosarcoma	1
Gastric ulcer	2
Malfunctioning gastroenterostomy	1

Classification as to difficulty encountered at operation:

Difficult, 61 (large chronic ulcers with considerable deformity and adherence to surrounding structures).
Simple, 39.

Types of complications:

Atelectasis	2
Mechanical small bowel obstruction.....	1
Pulmonary embolus	1
Ileus	1
Bronchopneumonia	1
Wound infection.....	1
Thrombophlebitis	1
Wound dehiscence	1
Subphrenic abscess and pulmonary embolus.....	1

Following the usual gastrectomy in which the disintegrating tube has been employed, the patient leaves the operating table with a Levine tube in place. On the morning of the first postoperative day he is encouraged to drink water freely. The Levine tube is connected with constant suction, thus affording thorough irrigation of the stomach and removal of accumulated mucus. At noon on the first postoperative day, the Levine tube is removed and the patient is given water, tea, and broth, at first in small quantities, but in increasing amounts as he tolerates them.

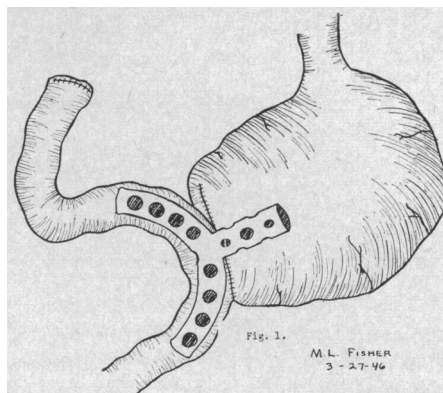


Figure 1.—Diagrammatic representation of the T-tube in position.

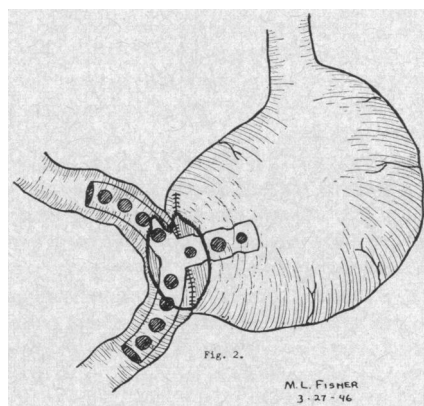


Figure 2.—Diagrammatic representation of the T-tube being placed loosely in the gastrojejunostoma.

With the tube in place there can be no obstruction at the stoma and the only factor causing gastric distention and vomiting is the temporary paralysis of the bowel that usually is present for a certain length of time following gastrectomy or any other laparotomy. Just as soon as the bowel tone approaches normal and peristalsis is reestablished, the patient is able to take liquids freely. For this reason the double-barrelled feeding tubes are now almost never employed. These patients usually tolerate a soft diet on the third day and receive a light diet on the fifth. It has been necessary in approximately one-third of these cases to reinsert the Levine tube for a short time on the second postoperative day, for the reasons previously outlined.

The tube is not presented as a substitute for good surgical technique. Gentle handling of tissues and careful approximation are still as important as ever in obtaining good results. However, experience with the tube emphasizes certain very definite and valuable benefits which its use confers upon the patient:

1. Smoother postoperative convalescence. One of the most notable clinical observations is that the patients postoperatively are more comfortable from the very day of operation. It is refreshing to see them take nourishment early without discomfort, to

see their postoperative temperatures much lower on the average than formerly, and to be able to discharge them without untoward event, in many instances on the seventh postoperative day.

2. It will be seen by reference to the table that postoperative complications have been few, indeed, and these for the most part unrelated to the abdominal condition. Doubtless, early ambulation has played an important part in this favorable showing. The technically difficult resection of an indurated ulcer from the head of the pancreas is approached more optimistically with the knowledge that a troublesome closure will not be subjected to the hazard of increased intraluminal pressure during the first few postoperative days when so much depends upon the integrity of the suture line.

3. Types of operation have varied as will be apparent from the data, but in each instance the use of the disintegrating tube has added a factor of safety that has heretofore been lacking. Naturally, the surgeon will and should individualize in selecting the indication for the use of this device as for any other procedure, but it can readily be seen that it is particularly useful in those cases of carcinoma or gastric ulcer wherein a very high resection such as subtotal or almost complete gastrectomy is performed. These resections are notoriously hazardous from the standpoint of angulation and kinking at the stoma, and the use of the tube in cases of this type is particularly justified. The tube has been used

quite satisfactorily in a number of gastroenterostomies as well.

ADDENDUM

Since these data were compiled, two deaths following gastrectomy for complicated duodenal ulcer have occurred. In one case the patient was a 61-year-old male with complete dehiscence of the abdominal wall on the sixth postoperative day. Following repair, bronchopneumonia developed, accounting for death. The duodenal stump was intact.

The second patient was a 55-year-old male with severe diabetes. Disruption of the duodenal stump developed on the fifth postoperative day and the patient died in spite of drainage. Autopsy showed a perfectly functioning gastroenteric stoma and a sound suture line. The duodenal stump, however, had not healed satisfactorily. This is the only instance of duodenal disruption following the use of the tube that has come to the authors' attention, notwithstanding that the tube is being used extensively in Los Angeles and elsewhere throughout the country.

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